Peer Reviewer Report - Scalloped Hammerhead Shark Status Review Report

Peer Reviewers:

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Dr. Kim Holland
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Questions:

Evaluate the adequacy, appropriateness and application of data used in the Status Review document.

1. **In general, does the Status Review include and cite the best scientific and commercial information available on the species, its biology, stock structure, habitats, threats, and risks of extinction?**

   Klimley - The author has assembled a very comprehensive review of the scientific literature on the biology, stock structure, and habitats, threats, and risks of extinction.

   Holland - I found this review to be very well written and comprehensive in its coverage of the best available information regarding the status of the various worldwide populations of the scalloped hammerhead shark S. Lewini.

   Harry - Yes. The scientific and commercial information included in the status review was very comprehensive. In some earlier sections of the document I provided some suggestions of literature that had not been included, however all of these were referenced in subsequent sections. I was not aware of any publications that had not been included, and I suspect the vast majority of relevant scientific literature on the scalloped hammerhead was included.

2. **Are the scientific conclusions factually supported, sound, and logical?**

   Klimley - As one who has worked extensively with this species, I am impressed with the amount of information assembled to support the conclusions of this status review. For example, the impact of fisheries on juveniles (and recruitment) is assessed from catch records from Brazil, Gulf of Mexico, Central Mexican Pacific, southwest Madagascar, Mauritania, and Queensland, Australia.

Harry - Yes. The Status Review includes all of the issues that I'm aware of that are pertinent to the conservation of this species. In addition to the more widely appreciated issues such as direct fishing mortality itself, the review also discusses issues such as the high levels of post-capture mortality, possible effects of overfishing on one sex, and issues related to illegal fishing. All of the issues relevant to the scalloped hammerhead are supported by references, and are discussed in a logical manner, so I believe that the scientific conclusions are well-founded

3. **Where available, are opposing scientific studies or theories acknowledged and discussed?**

Klimley - Under the title, "Depensation", there is a very interesting discussion of the effect of sexual segregation and its implications for fisheries management.

Harry - Yes. The authors discuss a number of these. For example, there is disagreement among scientists about some of the magnitude of declines of scalloped hammerheads in areas such as the Gulf of Mexico. The Status Review also acknowledged that there were issues with species identification in a paper reporting 99.9% declines in scalloped hammerheads from the Mediterranean.

4. **Are uncertainties assessed and clearly stated?**

Klimley - This is particularly evident in the section "Formal Modeling Approaches". The overall population is said to be in decline, but this is qualified for the northwest Atlantic and Gulf of Mexico.

Holland - Throughout this review process it is essential to recognize the very significant limitations of the available data (and the possibility that these data may be flawed or erroneous) and this was clearly pointed out at various places in the document.

Harry - Yes. The uncertainties associated with this species are explicitly stated. More implicitly, the descriptions of commercial fisheries reports also give the reader clear picture of how poorly scalloped hammerhead catches are documented globally.

Evaluate the findings made in Appendix I – Assessment of Extinction Risk for the Scalloped Hammerhead Shark.

1. **Are the results of the Distinct Population Segment Analysis supported by the information presented?**

Klimley - A table indicating the differences in the extent of movement and life history characteristics would make it easier to appreciate the basis on which six DPS exist of this species.

Agency Response – We have created a table that shows these differences and included it in the final product.

Holland - I found the logic for establishing the various Distinct Population Segments (DPS) to be straightforward and appropriate and the evaluation of those DPS to be based on the best available data.

Harry - Yes. The results are clearly well-researched and well-supported by the available information.

2. **Are the methods used for the Extinction Risk Analysis valid and appropriate?**

Klimley - The decisions are made mainly from genetic studies. Are these genetic differences accompanied by differences in life history, which make the DPS units unique and important in responding to differences in climate? This is a crucial question, and there seems to be insufficient descriptive information available for the species in different regions.

Agency Response – As the reviewer points out, there is very limited information available for the species in different regions. As such, the DPS identifications were based on the best available information (including genetic and behavioral data) relevant to the discreteness and significance criteria of the DPS policy. The Extinction Risk Analysis examined both demographic risks, which incorporated genetic information and life history characteristics, as well as threats to the species (such as overutilization), using the best available scientific information.

Harry - Yes. I felt that the methods were appropriate.

3. **Are the results and conclusions of the Extinction Risk Analysis supported by the information presented?**

Klimley - Copious information was presented for each of the DPS. The Eastern Pacific DPS was rated as '4" for extinction risk. I am intimately aware of the intense artisanal fishing pressure on the species, particularly in the Gulf of California. In accordance, my colleagues and I have noted their absence at two seamounts, El Bajo Espiritu Santo and Gorda, in this region since the early 2000's. We also observed few hammerheads in the Revilligigedos Islands, offshore the Baja Peninsula. However, at the same time, we have encountered large schools at Malpelo Island off Colombia and Darwin and Wolf Islands of the Galapagos. These locations are protected in a way due to the popularity of ecotourism for sharks at these sites. If some level of protection is present at these latter sites, I do not think that the species will become extinct.

Agency Response – Although there may be protected sites with large schools of scalloped hammerheads, there is also evidence of illegal fishing by both local fisherman and industrial longliners within many of these marine protected areas that the Extinction Risk Analysis (ERA) team felt may put these populations in jeopardy (WildAid 2003, Hearn et al. 2010, Bessudo et al. 2011). For example, in Cocos Island National Park, off Costa Rica, a "no take" zone was established in 1992, yet populations of S. lewini continued to decline by an estimated 71% from 1992-2004 (Myers et al. nd). In Ecuador, concern over illegal fishing around the Galapagos Islands prompted a 2004 ban on the exportation of fins but only resulted in the establishment of new illegal trade routes and continued exploitation of scalloped hammerhead sharks (CITES 2010). In 2007, a sting operation by the Ecuadorian Environmental Police and the Sea Shepherd Conservation Society resulted in a seizure of 19,018 shark fins that were being smuggled over the border on buses from Ecuador to Peru. The fins were believed to come from protected sharks in the Galapagos Islands (Paul 2009). More recently, in November 2011, Colombian environmental authorities reported a large shark massacre in the Malpelo wildlife sanctuary, an area where divers reported sightings of schools of more

than 200 hammerhead sharks. The divers counted a total of 10 illegal Costa Rican trawler boats in the wildlife sanctuary and estimated that as many as 2,000 sharks may have been killed for their fins (Brodzinsky 2011). As such, the ERA team has strong concerns regarding the level of overutilization and limited regulatory mechanisms or enforcement of fishery regulations throughout the entire range of this DPS and concluded that it has a high risk of extinction because it is at or near a level of abundance and productivity that places its current and future persistence in question throughout its entire range.

Holland - Given these data 'challenges' and given what is reasonably well known about the population trends of S. lewini, about existing fisheries and about existing or imminent management measures, I find the conclusions in Appendix I regarding extinction risk for the various DPS to be appropriate. There are minor discrepancies in the text or points that may be open to debate but certainly nothing that would invalidate the overall findings of the review. I find this to be a thorough and expert review of the available information regarding the status of this species.

Agency Response – Although the reviewer comments that there are minor discrepancies in the text, he does not specifically identify them and, as such, we have no response.

Harry - Yes. After reading this section I felt that the authors had provided an objective description of the risks facing scalloped hammerheads in each of its Distinct Population Segments globally.

Other Comments:

Harry - I found the Status Review to be very extensive, and I did not have that many comments. Also, several of my comments earlier in the document (e.g. inclusion of certain references) are addressed later on, so feel free to disregard them. In summary, I thought this was a well-researched and high-quality document, and I congratulate you on being able recognise all of the major issues relating to this species and objectively evaluate its current and likely future threats.

Comments received on specific sections (by reviewer Dr. Harry):

<u>Section: Life History and Ecology</u>

Reproduction and Growth -

Statement: "While it appears that maturity, age, and growth estimates vary by region, it is unclear whether these differences are truly biological or a result of differences in band interpretations in aging methodology approaches (Piercy et al. 2007). "

Comment: This is a very important consideration for this species. Any real interspecific differences that exist between species are likely to be obscured by a number of factors, and this makes it very difficult to anticipate how this species will be affected by activities such as fishing. For example, gear selectivity and small sample sizes probably explain most of the differences in values of L_∞. The growth coefficient K, is highly correlated with L_∞ so bias in this parameter will also affect K. Similarly methodological

inconsistencies and a lack of any concrete validation make it difficult to make any meaningful inferences from the currently available data. Many similar sized pelagic sharks (e.g. blue sharks) have been shown to grow quite rapidly, while many similar sized coastal sharks (e.g. sandbar sharks) are known to grow very slowly. The life cycle of the scalloped hammerhead includes both coastal and pelagic phases so it could plausibly be a fast or slow growing species. But the high amount of uncertainty in life history parameters makes it difficult to make this distinction at present. In recent years, more studies have been published suggesting this is a long-lived and slow growing shark. Molecular data also suggests that the scalloped hammerhead may actually be a number of 'cryptic' species, which could also explain the disparity in life history traits.

Table 1: Compilation of *S. lewini* life history characteristics from the published literature -

Comment: Harry et al (2011a) should be used as the reference for Australia NE and Australia NSW SE. von Bertalanffy growth parameters and maturity parameters are provided for males from both regions, and growth parameters for females from the two regions combined.

Agency Response – The appropriate references are included in the final product.

Section: Distribution and Abundance

Genetic Data –

Comment: Here is one additional study from Australia:
http://www.springerlink.com/content/9250w285355w7422/

Agency Response – We have cited this study in the final product.

International Catch -

Statement: "Despite this requirement, recent catches of hammerheads have not been provided to the WCPFC for a number of longline fleets, including fleets from among the top twenty countries reporting Pacific shark catches to the FAO"

Comment: Reference?

Agency Response – This statement is in regards to the information included in the countries' annual reports that are provided to the WCPFC. There is no specific reference, but the annual reports are public and available through the WCPFC.

Statement: "However, very little information exists on the abundance of these sharks off the coast of Africa or elsewhere in the Indian Ocean."

Comment: http://www.publish.csiro.au/?paper=MF05156 Dudley and Simpfendorfer (2006) examined abundance of S. lewini off South Africa using catch data from the Natal Sharks Board and found that scalloped hammerheads were one of the species that declined in abundance over the study period.

Agency Response – We have referenced this study in the final product.

On discussion of sharks in Australian waters – Comment: Sharks are also caught in bather protection programs, which involve using beach netting and drum lines to catch sharks, and are in place on most popular metropolitain beaches in New South Wales and Queensland on the east coast of Australia. These aren't considered commercial fisheries, but they certainly are an added extractive harvest of hammerheads in Australian waters (see reference by Reid et al (2011) in your reference list). There are quite a few publications available on Australia's shark control programs including some grey literature documenting declines in hammerhead species. I can provide these if necessary. Hammerhead sharks (likely scalloped) are also caught in Australia's East Coast Tuna and Billfish Fishery, and West Coast Tuna and Billfish Fishery, which are managed by the Commonwealth government.

Agency Response – Added information on bather protection programs and Australian fisheries in final product.

U.S. Fisheries - Total Bycatch Estimates -

Statement: "For all species of hammerheads, this bycatch estimate tripled to 2,414.06 lbs. Catches in the other fisheries and in other regions were found to be negligible"

Comment: All species, or unspecified? I would suspect most or all of these animals would be scalloped, perhaps just not identified to species

Agency Response – Revised the sentence to reflect it is the hammerhead complex (*Sphyrna* spp.).

Section: Analysis of the ESA Section 4(A)(1) Factors

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes – Effects of the Shark Fin Trade -

Comment: Is a definition for nei given somewhere here? I didn't notice

Agency Response – Included the definition of "nei" (= not elsewhere included).

Assessment of Extinction Risk for the Scalloped Hammerhead Shark (*Sphyrna lewini*)

Comment on the cover photo: Probably not hugely important, but this looks like a great hammerhead, Sphyrna mokarran, to me (the pelvic fin shape and the angle of the shape of the head are the best ways to tell on this animal)

Agency Response – We have replaced the photo with a confirmed scalloped hammerhead photo.

Section: Distinct Population Segment Analysis

Indian and Pacific Ocean-

Statement: "Thus, the Indo-West Pacific population and Central Pacific populations are discrete and significant from the Atlantic and Eastern Pacific populations as a consequence of genetic differences, and from each other as a consequence of physical factors and differences in regulatory mechanisms across international governmental boundaries."

Comment: Significantly different?

Agency Response: "Significant [to the global taxon]" in terms of how it is defined within the Agency's DPS policy.

Section: Extinction Risk Analysis

Indo-West Pacific DPS - Spatial Structure/Connectivity –

Statement: "There may be some concern of a contraction of the DPS range, as heavy fishing in Indonesian waters have displaced some sharks further west into Australian waters (Field et al. 2009)."

Comment: I didn't understand this sentence. Does displaced mean over-fished or is it referring to displaced fishing effort?

Agency Response: Revised this sentence to refer to displaced fishing effort in final product.